Role of the between-plot plant functional diversity in uplandsdairy farms
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Introduction

● Context
In upland areas climate or topography structure strongly influence farm systems.
  ✗ need to produce stocks to feed animals during winter season
  ✗ small or medium size structure with a scattered spatial organisation of the plots

● Issue
  ✗ Maintaining the economic viability of the farm requires to search more favourable milk prices and profit margins
  ✗ PDO = a good response to this issue + it sets grassland at a key point of the forage system
Introduction

- The question
  - How can inter-plot diversity of grasslands on the farm be a positive feature in the sustainability of dairy systems?

- The program
  - Research-Development project

- Area and Process of the study
  - Massif Central
    - 2 PDOs: “Le Laguiole” and “Le Cantal”
    - Survey identifying farmers’ practices
    - Botanic composition to assess the vegetation diversity of the plots

Material & methods

- Areas
  - **Laguiole**: 1,900 km², altitude from 700 to 1,300 m, average of 1,300 mm annual rainfall
    - 4 farms
  - **Cantal**: 7,200 km², altitude from 700 to 1,000 m, 600 mm to 1,600 mm annual rainfall
    - 6 farms
  - Representative of pedoclimatic variability
  - Key figures of the 10 farms:
    - total cultivated area: 38-77 ha,
    - 27-50 dairy cows,
    - calving season: fall-winter,
    - intensification level:
      - 2,800 to 7,300 L/dairy cow
      - 2,400 to 6,500 L/ha of forage area
Material & methods

- Identification of farmers’ practices
  - Vegetation survey
    - In every plot: contribution of dominant species account for more than 17% of the botanical composition
    - according to Cruz et al. 2002, each species functional class, defined by the dry matter content of blades

<table>
<thead>
<tr>
<th>Types</th>
<th>Species (examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Holcus lanatus</td>
</tr>
<tr>
<td>B</td>
<td>Dactylis sp.</td>
</tr>
<tr>
<td>C</td>
<td>Agrostis capillaris</td>
</tr>
<tr>
<td>D</td>
<td>Festuca rubra</td>
</tr>
<tr>
<td>E</td>
<td>Brachypodium sp.</td>
</tr>
<tr>
<td></td>
<td>Lolium multiforum</td>
</tr>
</tbody>
</table>

From Ansquer et al., 2004

Material & methods

- Identification of farmers’ practices
  - Diagnosis of forage practices
    - Use phenology to diagnose quality of practices mowing and grazing

![Graph showing the relationship between sum of temperature and the percentage of b + D types of grass.](image)

- Comparison of the diagnosis of forage practices to a reference table to estimate the quality of basis ration
Results and discussion

- Figure 1: Part of each functional type in forage surface
- Figure 2: Diagnosis of mowing production unit
- Figure 3: Comparison of mowing and grazing practices with supplying of concentrates

At farm scale, grassland vegetation is diversified, but with a wide range of potential of production...

In each farm, we described 4-6 different functional types that showed a good functional diversity.

- Productive grasses: 70 to 100 % of A + B + b types
  - varied productive potential

- Among productive grasses, 50 to 85 % are early flowering species
  - varied precocity potential

... flexibility of management and autonomy in uplands farms

Figure 1: Part of each functional type in forage surface
The functional approach allows a diagnosis of the farmer’s practices

3 types of mowing:
1. Mowing before the ear stage (G15)
2. Mowing between the ear stage and flowering (D12)
3. Mowing after flowering (F15)

Diversity of harvested vegetations

Good quality forages
Quality / quantity balanced
Low quality forages

Analysis of the system practices: identifying the part of mowing and grazing practices

Late mowing
Intermediate mowing
Early mowing

F15
C12
B12

Concentrates consumption ++ vs - - // dairy production

Figure 2: Diagnosis of mowing production unit

Figure 3: Comparison of mowing and grazing practices with supplying of concentrates
Concentrates consumption vs dairy production

Decreasing in forage quality

Analysis of the system practices: identifying the part of mowing and grazing practices

Conclusions

- Our study shows that, in upland farms, forage potential of grasslands is under-used.
- Reinforcing confidence of farmers in their grazing practices will let them to improve efficiency of dairy production units.
- Such studies have to supply objective references to encourage grasslands use which provides sustainability.
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